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Lachat, Mario ; Romero Toledo, Maricarmen ; Glenck, Michael ; Veith, Frank J ; Schmidt, Christian A ; Pecoraro, Felice

Abstract: PURPOSE: To describe the endovascular treatment of intra-abdominal perigraft seromas associated with small-caliber expanded polytetrafluoroethylene (ePTFE) grafts. CASE REPORTS: Two patients who underwent hybrid repair of thoracoabdominal aortic aneurysms in which renovisceral bypass grafts were implanted presented with large, symptomatic perigraft seromas. The 5- to 8-mm-diameter ePTFE bypass grafts believed to be involved in the seromas were successfully relined with self-expanding Viabahn stent-grafts in percutaneous procedures. The patients' symptoms were relieved, and imaging follow-up (18 and 10 months, respectively) has shown near complete resorption of the seromas. CONCLUSION: It is expected that this minimally invasive technique could be very valuable in treating aortic, renovisceral, and peripheral perigraft seroma.

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◆CASE REPORT ◆

Endoluminal Stent-Graft Relining of Visceral Artery Bypass Grafts to Treat Perigraft Seroma

Mario Lachat, MD[1]; Maricarmen Romero Toledo, MD[1]; Michael Glenck, MD[2]; Frank J. Veith, MD[3]; Christian A. Schmidt, MD[1]; and Felice Pecoraro, MD[4]

[1]Clinic for Cardiovascular Surgery and [2]Interventional Radiology, University Hospital Zurich, Switzerland. [3]New York University Medical Center, New York, New York, and The Cleveland Clinic, Cleveland, Ohio, USA. [4]Vascular Surgery Unit, University of Palermo, AOUP ''P. Giaccone,'' Palermo, Italy.

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Case Reports: Two patients who underwent hybrid repair of thoracoabdominal aortic aneurysms in which renovisceral bypass grafts were implanted presented with large, symptomatic perigraft seromas. The 5- to 8-mm-diameter ePTFE bypass grafts believed to be involved in the seromas were successfully relined with self-expanding Viabahn stent-grafts in percutaneous procedures. The patients' symptoms were relieved, and imaging follow-up (18 and 10 months, respectively) has shown near complete resorption of the seromas.
Conclusion: It is expected that this minimally invasive technique could be very valuable in treating aortic, renovisceral, and peripheral perigraft seroma.

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Key words: seroma, stent-graft, prosthetic graft, graft relining, endovascular repair, polytetrafluoroethylene graft, vascular graft, bypass surgery

Perigraft seroma is a persistent, sometimes expanding, fluid collection confined within a fibrous pseudomembrane surrounding a vascular prosthesis, typically those made of expanded polytetrafluoroethylene (ePTFE) material. This sequela has been regularly reported since the early 1980s, but there is no standardized treatment for this complication.[1] We report two cases of symptomatic perigraft seroma developing after renovisceral bypass surgery that were successfully treated by relining the grafts with self-expanding stent-grafts.

CASE REPORTS

A 57-year-old patient with Crawford III thoracoabdominal aortic aneurysm was treated in May 2010 with a staged hybrid procedure. In the first stage, renal and visceral arteries were bypassed with ePTFE grafts. An 8-mm ePTFE feeding graft was attached to the left external iliac artery; its distal end was connected to the superior mesenteric artery (SMA) using the Viabahn Open Revascularization TEChnique (VORTEC)[2] with a 9-mm×5-cm Viabahn stent-graft (W.L. Gore & Associates, Flagstaff, AZ,

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Corresponding author: Mario Lachat, MD, Clinic for Cardiovascular Surgery, University Hospital Zurich, Ramistrasse 100, CH-8091 Zurich, Switzerland. E-mail: *mario.lachat@usz.ch*

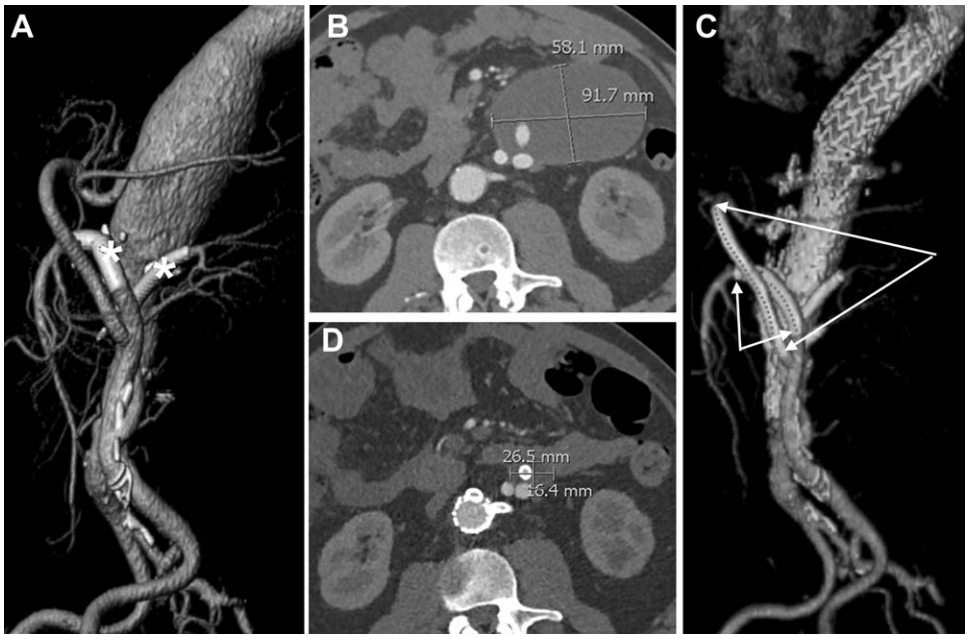

Figure 1 ◆ (**A**) CT scan reconstruction showing the renovisceral bypasses. The asterisks denote the Viabahn stent-grafts used as connectors to the superior mesenteric and the left renal arteries in the VORTEC technique. (**B**) Perigraft seroma. (**C**) CT scan reconstruction showing relining (between arrows) of the grafts to the SMA and the celiac trunk. (**D**) Appearance of the perigraft seroma 13 months after relining.

USA). Further, 2 branches (6-mm ePTFE grafts) were attached to the feeding graft for the celiac trunk (anastomosis to the hepatic artery) and left renal artery, in which VORTEC was also used (7-mm×5-cm Viabahn; Fig. 1A). The thoracoabdominal aneurysm was excluded some weeks later in an endovascular repair that required a periscope endograft to be placed to the right renal artery (7-mm×5-cm Viabahn).[3]

During follow-up, the patient developed a large perigraft seroma (70×96×62 mm) accompanied by abdominal discomfort, especially during the night (Fig. 1B). In September 2011, it was decided to treat the seroma using a relining technique. Via a percutaneous transfemoral access, a 9-mm×5-cm Viabahn stent-graft was deployed inside the 8-mm SMA graft. Another 9-mm×10-cm Viabahn stent-graft was used in the 6-mm celiac trunk graft (Fig. 1C). Finally, Viabahn stent-grafts covered most of the endoluminal surface of the ePTFE bypass grafts that were thought to be responsible for the seroma, as both were surrounded or adjacent to the seroma. The procedure was uneventful, and after a follow-up of 6 months, the seroma had decreased by 50%, and the patient was asymptomatic. After 18 months, the seroma has nearly disappeared (Fig. 1D). In addition, an endoleak type Ib was treated during follow-up using parallel grafts to the left lower renal artery and right renal artery and an aortic stent-graft distal extension.

The second patient was a 64-year-old woman who was treated for a Crawford I thoracoabdominal aneurysm with a staged hybrid procedure in March 2008. In the first stage, the renovisceral bypass grafts were implanted. A 10-mm ePTFE feeding graft was attached to the left external iliac artery proximally, and its distal end was anastomosed to an 8-mm ePTFE graft intended to revascularize the celiac trunk (anastomosis on the hepatic artery). Three 5-mm ePTFE branch grafts were attached to the feeding graft using VORTEC and a 6-mm×5-cm Viabahn stent-graft to the right renal artery, a 5-mm×5-cm Viabahn to the left renal artery, and a 7-mm×5-cm Viabahn to the SMA. The aneurysm was excluded endovascularly a few weeks later (Fig. 2A).

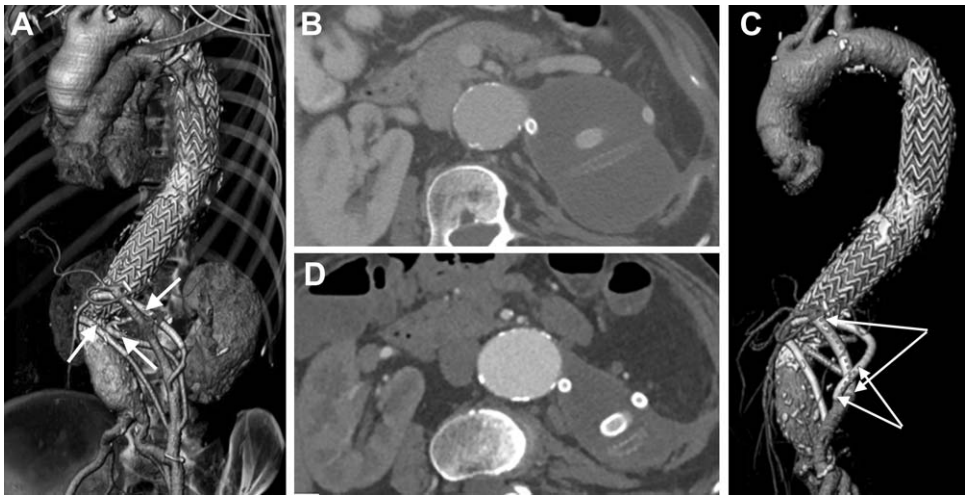

Figure 2 ◆ (**A**) CT scan reconstruction showing renovisceral bypasses. The arrows point out the Viabahn stent-grafts used as connectors for the superior mesenteric artery and both renal arteries. (**B**) Perigraft seroma. (**C**) CT scan reconstruction showing relining (between arrows) of the grafts to the superior mesenteric artery and the celiac trunk. (**D**) Appearance of the seroma 3 months after relining.

As in the first case, a large symptomatic perigraft seroma (170×113×85 mm) developed around the renovisceral grafts in follow-up (Fig. 2B). It was percutaneously drained with a pigtail catheter, but this proved ineffective in reducing the volume. The capsule was resected in an open procedure, but the seroma reappeared soon thereafter, ultimately compressing the left renal artery bypass, which thrombosed. A definitive relining of the visceral grafts responsible for the seroma was performed, implanting a 7-mm×5-cm Viabahn in the proximal part of the graft serving the SMA and two 9-mm×5-cm stent-grafts in the branch to the celiac trunk (Fig. 2C). The patient became asymptomatic rapidly, and the seroma decreased by 70% within 3 months (Fig. 2D). She is currently symptom-free at 10 months after the relining.

DISCUSSION

Perigraft seroma has been noted after most types of peripheral vascular reconstructions, but mostly in subcutaneously tunneled grafts (axillofemoral bypass and dialysis access grafts).[1] It is uncertain whether seroma involving Dacron and ePTFE grafts is caused by the same mechanisms, but it is obviously more frequent with the latter.[4] The larger pore size of ePTFE (~30 μm in size) compared to Dacron may play a role in the pathogenesis of perigraft seroma. Unknown patient or procedure-specific factors may impact the porosity of ePTFE grafts, leading to leakage (ultrafiltration) through the graft wall, eventually resulting in perigraft seroma. Other possible mechanisms include the administration of heparin, lipolysis, and damage of the graft during placement, or a subclinical infection.[5] The presence of a perigraft seroma makes graft incorporation into surrounding tissue impossible,[1] so there is no tissue ingrowth into the graft pores and porosity remains high.[6] The incidence of perigraft seroma is probably underreported, but the complication deserves attention due to the associated morbidity, e.g., graft thrombosis from compression,[4] skin necrosis, secondary graft infection, anastomotic aneurysm formation, and anastomotic bleeding.[7]

Treatment of perigraft seroma might include incision and drainage or aspiration of the fluid or observation.[8] However, as we saw, needle aspiration or drainage is often ineffective.[6,9] Other options are external surface sealing by application of fibrin glue components,[5] wrapping the graft with saphenous vein,[10] or sac imbrication with suture and replacement of the graft.[4,7,9] However replacement of the graft with a new ePTFE graft

results in a surprising high percentage of recurrent seroma in most reports.[11]

The idea of relining surgical grafts with stent-grafts is derived from a similar problem that has been noted with early versions of the ePTFE and even Dacron aortic stent-grafts.[12] Some of these fabrics are highly porous and have been suspected of causing endotension and secondary aneurysm sac growth.[4,12,13] In such cases, relining most of the surface of the aortic stent-graft was effective in stopping aneurysm growth, and sac shrinkage was often observed.[13,14] The relining technique has been applied to thoracic prosthetic grafts as well,[15] but not to our knowledge in small bypass grafts. In our patients, we decided to use this approach in the renovisceral bypasses. The significant regression we observed in these seromas after relining the ePTFE bypass grafts suggests that the method is viable in smaller conduits. The question of how porosity is altered in some patients remains unanswered, however. Relining should not be performed as a standalone measure in infected grafts because infection has to be addressed surgically.

Conclusion

These cases show that using self-expanding stent-graft to reline ePTFE peripheral grafts, such as those used in renovisceral bypass surgery, is effective in the short term for treating symptomatic perigraft seroma. Relining can be performed percutaneously under local anesthesia and is applicable to most aortic, renovisceral, and/or peripheral grafts. More experience and long-term results are mandatory before this method can be recommended widely, especially to treat hemodialysis grafts.

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